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ABSTRACT

This guide contains suggested units of instruction for the first two years of instruction in secondary vocational agriculture. It is intended to aid teachers and administrators in planning instructional programs to equip students with essential basic competencies required for more specialized programs. Instructor materials include information on use of the guide for general curriculum development and as a specific planning document and a yearly unit-time outline. The competency-based units of instruction are divided into the following areas: agricultural program (impact of agriculture and agricultural programs on society), leadership (Future Farmers of America, leadership development, the supervised occupational experience program), agribusiness (leadership, working in agribusiness, sales and service skills, distribution and marketing, management, records and procedures), mechanics (shop management and safety, drawing and sketching, use of hand tools, hardware, basic carpentry and construction, hot metal skills, cold metal, welding, tractor and machinery operation and safety, basic electricity, small gas engines), animal science (livestock selection, management, feeding, health and care), and plant science (plant growth and reproduction, soils, soil conservation, fertilizers, field crop management, range management, horticulture, crop pest management, chemicals). Each unit consists of a list of performance objectives and a listing of selected references. (YLB)

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CORE CURRICULUM
for
Vocational Agriculture Education

Montana COPY

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TWO-YEAR CORE CURRICULUM
FOR
AGRICULTURAL EDUCATION
IN
MONTANA

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FORWARD

The Montana Two Year Core has been prepared to help teachers of vocational agriculture prepare both short and long range curriculum goals and to provide some standardization to the secondary vocational agriculture program in Montana. The competencies included within the core are those which research has shown to be appropriate for all students whether they are interested in agribusiness or production agriculture.

The competency portion of the core has been designed to allow a considerable amount of flexibility for the local teacher to select those skills most appropriate for his/her community based on an occupational needs assessment. No attempt has been made to indicate which of the units should be taught first although it is suggested that the introductory units be taught early in the student's vocational agriculture program.

Special consideration has been given to including those science, math, and computer science competencies that are appropriate to the vocational agriculture program. This should help in coordinating the agriculture program with the other instructional programs offered in the local school. A section on planning the local curriculum has been provided to help teachers, administrators and advisory council members in developing a well rounded vocational agriculture program.

TWO-YEAR CORE CURRICULUM
FOR AGRICULTURE EDUCATION IN MONTANA

Montana vocational agricultural educators have periodically assessed their curriculum. The concern for up-to-date curriculum for the vocational agriculture program has prompted teachers, supervisory staff, and teacher educators to continually seek ways to assess "what is" and look for new "ways and means" to improve the educational activity and experiences they provide their students.

The first effort toward developing a competency based core curriculum began in 1971 with the initiation of a series of Montana Agricultural Manpower Research studies. The purpose of this research was to:

1. assess the agricultural production and agribusiness job opportunities,
2. define the agricultural production land agribusiness job titles,
3. determine the competencies (knowledges, skills and attitudes needed by persons employed in agricultural production and agribusiness,
4. determine the several competencies unique and common to agricultural production and agribusiness, and
5. design and pilot test a competency based instructional program in agricultural education at several educational levels.

Through the early involvement and commitment of representatives from the Montana Vocational Agriculture Teacher's Association, the Helena Office of the Superintendent of Public Instruction, and the Montana State University Department of Agricultural & Industrial Education, a series of employment studies was completed. The competencies that were extrapolated from this data formed the basis upon which the initial core curriculum was developed. This document is a revision of the two-year core curriculum completed in 1983.

Since the initial agricultural employment studies were completed, the continued involvement of practitioners in the field to updating employment data and identify needed competencies to keep pace with modern agricultural technology has been continuous. The continual involvement of practitioners has contributed much to this effort to provide an updated Montana Two-Year Core Curriculum. It is hoped that the information contained in this document will be of assistance to teachers responsible for designing and implementing educational experiences related to the agricultural industry.

Acknowledgments

Appreciation is expressed to all Montana vocational agriculture teachers and others who, in some way, assisted in the development of this core curriculum. A special thanks is given to Mr. Jim Larson, Custer vocational agriculture instructor, who helped implement the many science competencies into the core curriculum.

The Montana Model for Curriculum Development

A competency based instructional program based on known jobs and competencies in agriculture, is based on the idea that competencies needed by persons employed in agriculture will be taught within the school curriculum. Identified competencies which are to be used as a basis for curriculum development, are placed into three levels of learning difficulty as follows:

Level One Competencies -- Taught in grades 9 and 10
Level Two Competencies -- Taught in grades 11 and 12
Level Three Competencies -- Taught in grades 12 and 14

If agricultural education in Montana is to meet the broadening needs, interests, and goals of an expanded, multi-faceted student clientele, it will be necessary to develop a coordinated instructional program in agriculture, beginning with the freshman year in the high school and continuing through the second year of post-secondary level training offered by either area vocational centers or community colleges.

As was mentioned, the first step in the development of a coordinated instructional program in agriculture is to identify those competencies which should be taught in every department of vocational agriculture in the state. The competencies and concepts included in the "core" curriculum are common and applicable to specialized agricultural programs which would be offered during high school grades 11 and 12 or at the post-secondary level. The core program is designed to provide an educational foundation for students, who, upon completion of the core, wish to enroll in specialized programs in grades 11 and 12 which include:

Agricultural Production
Agricultural Sales and Service
Agricultural Mechanization
Forestry
Horticulture

The core curriculum guide contains suggested units of instruction and performance objectives for the first two years of instruction in vocational agriculture in Montana. We are hopeful this will serve as a guide for teachers, administrators, guidance counselors and local advisory council members when planning instructional programs to equip their students enrolled in the first two years of vocational agriculture with essential basic competencies required for the more specialized programs at the eleventh and twelfth year. Figure 1 portrays the curriculum development model for agricultural education in Montana.

Purpose and Use of the Guide for General Curriculum Development

The Montana Two-Year Core Curriculum Guide has been prepared to assist vocational teachers and administrators in secondary public schools to improve the quality of their educational program in agriculture. The two-year core represents a set of guidelines for local program development and thus, no attempt has been made to prescribe specific content and methodology

CURRICULUM MODEL

FOR THE

MONTANA VOCATIONAL AGRICULTURE PROGRAM

HIGH SCHOOL TWO-YEAR CORE CURRICULUM	HIGH SCHOOL SPECIALIZED PROGRAMS (Proposed)	POST HIGH SCHOOL VOCATIONAL-TECHNICAL PROGRAMS
Animal Science	Agricultural Production	Agricultural Production and Management Technology
Plant Science	Agricultural Sales and Service	Agricultural Business Technology
Agricultural Mechanics	Agricultural Mechanization	Agricultural Mechanization Technology
Leadership (FFA)	Forestry	Horticulture Technology
Supervised Occupational Experience Program	Horticulture	Forestry Technology
Ag. Business Management		Food Processing Technology
Careers		

FIGURE 1

for the local school. This is designed to give the teacher, advisor councils, and administrator the freedom and flexibility to develop innovative and unique programs in vocational agriculture that are especially designed for the local community. The guide will be most useful in situations where a comprehensive curriculum development is being undertaken, a new vocational agricultural curriculum is being developed or an existing program is being examined with consideration given to revision. For those contemplating developing a new program or making a major curriculum change, it will be helpful to review the steps in the total curriculum process.

Step I -- Establish the Basis for Vocational Agriculture in the Secondary School System:

The initial step in developing the vocational agriculture curriculum is to establish a sound basis for the total program. Simply stated, it involves establishing a need for the program, describing in detail how these needs can be met, and outlining the general goals of the program.

Generally speaking, Step I requires a study of the cultural, social, technological and occupational needs of the students in the community served by the school. Out of this study one should develop a description of the community, the school, and the students to be served. One should remember the bounds of the community served may go beyond the local school district.

A philosophical statement or rationale for the vocational agriculture program should then be developed which describes the contribution that vocational agriculture can make in meeting the needs of students in the community. Careful attention should be given to the definition of the program, statement of purpose and the preparation of detailed goals for the program.

Step II -- Establish a Basis for Vocational Agriculture at the Various Grade levels:

Having established the need for the program, Step II requires curriculum planners to direct their attention toward the different groups within the program. Each of these groups, often categorized by grade level, differ in age, maturity, career aspirations, individual abilities and interests.

By identifying the needs of each group of students, one can develop a rationale that will serve as a basis for developing agricultural activities which will meet those needs. Activities can be developed which will provide student experiences similar to those required for workers in production agriculture or agri-business. A well-designed vocational agriculture program for the first two years of high school should provide exposure to a vast number of concepts and occupations.

This core curriculum provides a group of objectives from which vocational agriculture teachers may choose as they consider each level of student. Remember, the objectives selected should be consistent with the overall goals of the program.

Step III -- Outline the Vocational Agriculture Program:

At this point in the curriculum development process, the program (units or courses) to be offered at the various levels should be identified. These units or courses will need to be appropriate in scope and sequence to create an effective learning situation.

Remember, units or courses should be selected based on the characteristics of the students within the particular grade level. It may not be possible to serve all students equally well when such things as class size, facilities and resources are taken into consideration. A careful analysis of the agricultural occupations in which the students have expressed interest will help provide insight into the competencies needed by entry level workers. The curriculum developer must then identify those competencies that are consistent with the goals of the program and maturity level of the students.

Step IV -- Prepare Teaching Materials:

The preparation of individual teaching plans and supplemental material will be the responsibility of the individual teacher. It will be necessary for the individual teacher to select and organize the course content. Unit plans, unit aims and goals, lessons and lesson objectives should be developed. Further decisions will need to be made as to the texts and references to use, and the teaching strategies to employ.

Unit and lesson titles should be descriptive in nature. Performance objectives, statement of expected student outcomes, which include minimum accepted standards of performance should be prepared for all individual lessons based on competencies needed by future employees.

The development of teaching strategies will vary with the grade level, content being presented, student population and the teacher. The resources of the local community should be used whenever feasible.

Step V -- Evaluate Curriculum and Instructional Effectiveness:

The teacher, as a curriculum planner, should consider two methods of evaluation. Instructional effectiveness can be examined through process evaluation (procedures followed), while the overall curriculum should be measured against product evaluation (graduates) of the program.

Evaluation of instructional effectiveness should determine how well vocational agriculture instructors have established their performance objectives and if the teaching techniques used and instructional material provided has enabled the student to meet the stated objectives. Innovative techniques should be incorporated into the traditional testing program to allow the students to display their mastery of the subject content. Process evaluation should be a continuous process.

Product evaluation should focus on measuring the outcomes of the program, placement and achievement, and advancement on the job. How well a worker is able to perform in the regular world of work can be a valid indicator of the appropriateness of the curriculum. However, before undertaking any type of evaluation, the program director must carefully plan how and from whom the data will be gathered.

The Format of the Core Curriculum

The Montana core curriculum is competency based. Competencies have been organized into clusters of knowledges, skills, and attitudes in various instructional areas that are deemed essential for all agriculture students regardless of their specific career choice. The cluster concept is based on the premise that many agricultural careers may be classified into related groups on the basis of identical or similar competencies required for successful entry level employment.

The cluster concept has several advantages for the vocational agriculture program and those students enrolled. The concept gives the student a greater opportunity to:

1. carefully appraise individual interests and abilities in a wide variety of agricultural careers,
2. see the relationships and commonalties that exist among a wide variety of agricultural careers,
3. make a wise choice when making a career choice,
4. learn competencies necessary for entry level employment in agriculture, and
5. develop transferable competencies that will enable an employee or entrepreneur to adapt to rapid technological changes in agriculture.

Instructional Units

The core curriculum for the first two years of vocational agriculture includes suggested units of instruction developed around seven instructional areas. The instructional areas include:

* Plant Science
* Animal Science
* Agricultural Mechanics
* Leadership
* Agricultural Career Planning
* Supervised Occupational Experience Programs (SOEP)
* Agricultural Business Management

Each large instructional area is further divided into units of instruction which are intended to include teaching objectives developed from those competencies deemed necessary for all students in the first two years of the vocational agriculture program.

Performance Objectives:

A well stated performance objective should include three separate and identifiable elements: 1) conditions or givens, 2) behavior and, 3) standards or criteria. Generally speaking the objectives given in the core include behavior only. This will allow greater flexibility for the local teacher when developing lesson plans in that conditions or givens under which the behavior is taught and standards or criteria expected may need to vary from community to community.

All objectives are clustered under an instructional unit. The objectives should be included in a series of lesson plans. Generally speaking, several lessons will need to be developed in order to properly and effectively teach the objectives.

Selected References:

A list of selected references (to be included in each instructional unit) is given following the objectives. The list of references is limited and individual departments may have other references in their library that will work equally well in developing individual lesson plans.

Using the Guide as a Specific Planning Document

The success of a vocational agriculture teacher in the classroom depends on many factors, one of which is a well planned curriculum. With today's agricultural technology advancing rapidly, it is very difficult to find sufficient time to provide all of the training that will be needed. Therefore, it puts a greater responsibility on every teacher in each local community where vocational agriculture is taught to provide quality instruction in a carefully selected range of instructional areas.

The core curriculum for the first two years of vocational agricultural instruction can be helpful to a teacher in selecting specific instructional content. The following suggestions are provided to illustrate how a teacher might use the guide to determine how much time to devote to each area of their program. The process is summarized in the example, "Yearly Unit-Time Outline". It should be noted that space has been provided on the sheet for a teacher to plan their own program. After a teacher has established the basis for the program at the various grade levels as suggested, proceed in the following manner.

1. Determine the total number of days you have for instructional activity in the school year. Subtract out days for individual project work, days for review and tests, and a reasonable number of days for extra activities that you are not aware of at the beginning of the school year. Estimate the number of days you have left to devote to instruction. In the example given there are 143 days for which the teacher can plan teaching activities.

2. Next, determine the percentage of time one should devote to each major area based on the needs of your local community. A teacher should give serious thought to the time breakdown. Remember, it is not necessarily what the students want but what they need that is important. In the example given, 40 percent (47 days) was set aside for Ag Mechanics. With the 20 days set aside for individual project work, this means that about 50 percent of the time will be devoted to Ag Mechanics activity. The major area time breakout is identified by the ** on the example.

3. Once the major time split between Ag. Mechanics and the rest of the program has been made, proceed to assign blocks of time to the major instructional units (see example page 9)

4. Finally, assign the number of days you plan to devote to the specific instructional units. Before assigning these time blocks, carefully study the objectives as outlined under the respective units of instruction in the core. Because of the amount of material that could be covered, you will probably find that you may have to leave some content out or postpone it until the junior or senior year of the program.

It is suggested that a teacher review the Yearly Unit-Time Outline regularly. No doubt, time shifts will have to be made throughout the course of the first two years of vocational agriculture. However, such a plan will serve as a valuable guide.

YEARLY UNIT-TIME OUTLINE

Example School: Bozeman Example Year: 1987-88

Local School: _____ School Year: _____

Major Areas	Instructional Units	Days Allotted Ag 1	**	Ag 2	**
LEADERSHIP		*15		*15	
	Introduction to the Vo-Ag Program	4			
	Leadership Through FFA	6		3	
	Leadership Development Through the Use of Parliamentary Procedure	5		6	
	Leadership Skills Development			6	
CAREERS		*2		*2	
	Agriculture Career Planning	2		2	
SOEP		*17		*17	
	The Role of the SOEP	3		1	
	Types of SOEP	5		2	
	Planning & Implementing SOEP	4		9	
	Record Keeping	5		5	
AG. MECHANICS		*52		*52	
	Shop Management & Safety	5		2	
	Agricultural Mechanics Drawing & Sketching	8		2	
	Hand Tools in Agricultural Mechanics	5			
	Basic Carpentry & Construction	5		12	
	Basic Agricultural Mechanics Skills	5		10	
	Cold Metal in Agricultural Mechanics			5	
	Arc Welding in Agricultural Mechanics			5	
	Oxyacetylene Welding in Agricultural Mechanics			5	
	Tractor and Machinery Safety	8			
	Basic Electricity in Agricultural Mechanics	5			
	Small Gas Engines in Agricultural Mechanics			5	
	Careers in Agricultural Mechanics	2		1	
ANIMAL SCIENCE		*27		*27	
	Introduction to Animal Science	5			
	Selection of Livestock	5		2	
	Care & Management of Livestock	10		5	
	Selecting Livestock for Projects	5		2	
	General Animal Feeding			5	

YEARLY UNIT-TIME OUTLINE (Continued)

Major Areas	Instructional Units	Days Allotted Ag 1	**	Ag 2	**
ANIMAL SCIENCE (Cont.)					
	General Animal Health and Care			5	
	Approved Practices for Raising Livestock			8	
	Careers in Animal Science	2			
AGRICULTURAL BUSINESS		*3		*3	
	Agricultural Business	3		3	
PLANT SCIENCE		*27		*27	
	Plant Growth and Reproduction	7			
	Basic Soils	5		5	
	Soil Conservation & Erosion Control	3		2	
	Soil Fertility and Fertilizer			5	
	Field Crop Management	8		5	
	Range Management			5	
	Basic Horticulture	3			
	Basic Forestry				
	Agricultural Chemicals			4	
	Careers in Plant Science	1		1	
	Sub Totals of Days	143		143	
Total Days for Class Work for the Year		180		180	
Days Set Aside for Individual Project Work		20		20	
Time Allotted for Test Review		6		6	
Time Allotted for Finals		6		6	
Time Allotted for Extras		5		5	
Total School Days Devoted to Instruction		143		143	

*Total Days Devoted to Major Instructional Area
**Space to be Used to Enter Estimate of Time for the Local Program

AGRICULTURAL PROGRAM UNITS

UNITS

THE IMPACT OF AGRICULTURE AND AGRICULTURAL PROGRAMS ON OUR SOCIETY

AGRICULTURAL CAREER PLANNING

UNIT -- THE IMPACT OF AGRICULTURE AND AGRICULTURAL PROGRAMS ON OUR SOCIETY

Unit completion of The Impact of Agriculture and Agricultural Programs on our Society Unit, the student should be able to:

Describe how the well being of a community depends on the availability of agricultural products.

Describe how regional differences, based upon physical environment will determine how basic human needs will be met.

Describe how success in meeting basic needs differs from country to country, region to region and culture to culture.

Identify ways in which a highly developed agricultural system allows many choices in meeting basic needs.

Describe why the farms in Montana have become larger and more specialized over the past 25 years.

Discuss the reasons why changing economic and political conditions lead to changes within our agriculture system.

Recognize how modern technology has aided agriculture to become more efficient.

Describe how consumer preferences cause a significant change in what, where and when agriculture products are produced and sold.

Identify the part of the work force in the community that is dependent on agriculture for employment.

Describe some products and services available in the community that are largely dependent upon production agriculture for existence.

Identify specific examples of how agriculture production has an economical impact on the local businesses.

Recognize how agriculture producers contribute to all segments of society.

Describe why the farms and ranches in the area are becoming larger and more specialized.

Describe how and why production and distribution of agricultural products requires decision-making skills.

Recognize why today's farming operations require large amounts of capital.

Illustrate how increased specialization in the production of agricultural products may result in economies of scale.

Discuss why the food and fiber produced in our country may be sold to other countries.

Describe how resources and environmental conditions require specialization of agricultural products and the involvement in international trade.

Illustrate how nations depend on one another to meet their domestic needs for agricultural food, feed and fiber products.

Describe how food and fiber prices are determined by a world market.

Identify specific examples of how good agricultural practices in the community have helped soil, water, forests and wildlife.

Describe how land erosion creates serious water pollution problems.

Discuss how communities establish rules that govern the use of land and water.

Describe how jobs in industry have changed because of research and development in agriculture.

Describe how competition for scarce resources with other segments of society requires continued research and development.

Discuss the manner in which the biological nature of the agricultural industry requires continued research and development.

Discuss how research in genetics is intended for the benefit of the agricultural system.

Identify marketing institutions through which plant products may flow.

Understand how marketing and sales agencies function.

Describe how the government provides services to the agricultural industry.

Describe some conditions when government assistance and intervention in other segments of society affect the farmer.

Discuss how price supports and subsidies are intended to provide increased stability to farming income.

Describe the vocational agriculture program in the community.

Explain how SOEP and FFA are integrated into a total Vocational Agriculture program in the community.

Describe the functions of SOE and FFA in relation to the vocational agricultural program.

Explain the responsibilities and benefits of being a student in the vocational agriculture program.
Identify the major areas of instruction to be included in a total vocational agriculture program.

Describe how vocational agriculture supports the agriculture in the community.

Develop individual long-range goals for participation in the vocational agriculture program.

Describe the role of the teacher, parent and local business persons in the vocational agriculture program.

Give a brief history of the vocational agriculture program in the local community.

REFERENCES

*Hays, Jack (Ed) (1981), Will There Be Enough Food?, Yearbook of Agriculture, United States Department of Agriculture, Washington, D.C.

*Marton, Larry B. (Ed) (1985), U.S. Agriculture in a Global Economy, Yearbook of Agriculture, United States Department of Agriculture, Washington, D.C.

*Hays, Jack (Ed) (1982), Food From Farm To Table, Yearbook of Agriculture, United States Department of Agriculture, Washington, D.C.

Hanson, Dick (1983), "Conservation Tillage Guide", Successful Farming , Des Moines, IA.
(This publication may be obtained from CIBA-GEICY Corporation, P.O. Box 18300, Greensboro, NC 27419, (919) 292-7100)

Production Credit Association of America (1983), Agriculture 2000 - A Look at the Future, Federal Intermediate Credit Banks, Denver, Colorado
(Copies of this book may be ordered through Federal Intermediate Credit Banks, Farmbank Service, 1200 East 47th Ave., Denver, CO 80239. Copies may be available through your local Production Credit Office)

United State General Accounting Office (Nov. 1985), Agriculture Overview - U.S. Food/Agriculture in a Volatile World Economy, GAO/RCED-86-3BR, Maryland.
(Requests for GAO reports should be sent to U.S. General Accounting Office, P.O. Box 6015, Gaitherburg, MD 20877, (202) 275-6241. The first five copies of each report are free; additional copies are $2.00 each)

The Hunger Project (1985), Ending Hunger: An Idea Whose Time Has Come, Praeger Publishers, NY

Agriculture Chartboard Committee (19845), 1984 Handbook of Agricultural Charts, No. 637, U.S.D.A., Washington, D.C.
(May be ordered from Superintendent of documents, U.S. Government Printing Office, Washington, D.C. 20402. Be sure to specify GPO SN: 001-019-00428-2; $3.50)

*These yearbooks may be available free of charge from your congressmen or representatives. They may also be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

UNIT -- AGRICULTURAL CAREER PLANNING

Upon completion of the Agricultural Career Planning Unit, each student should be able to:

Determine the number of employees needed in the agricultural/agribusiness, research and professional areas.

Explain how agricultural career clusters fit into the work world in the local community, Montana and the nation.

Discuss the economic importance of agricultural jobs in relationship to the economy of the local community, Montana and the nation.

Discuss job outlooks; employment trends and general educational needs for the future in agriculture/agribusiness or any employment that requires knowledge of agriculture.

Identify the major career cluster areas in agriculture and agribusiness.

Distinguish between agribusiness careers and agricultural production careers.

Discuss the importance of setting goals and objectives as it relates to careers.

Complete a self-inventory to identify individual values, interests, aptitudes abilities and personality traits in relationship to agricultural careers.

Demonstrate the ability to use the library as a means of studying different careers.

Identify the steps one should take in selecting a career in agriculture/agribusiness.

Select a major agriculture/agribusiness career and develop a set of objectives that would enable a person to enter that career.

Identify possible SOE programs that would support specific career choices.

Describe the type of leadership training that would be needed to prepare a person for selected agriculture/agribusiness careers.

REFERENCES

Applied Biological and Agribusiness Interest Inventory (Aptitude Test)

The Interstate Printers and Publishers, Inc.
Jackson at Van Buren
Danville, Illinois 61832

Essential Aspects of Career Planning and Development

The Interstate Printers and Publishers, Inc.
Jackson at Van Buren
Danville, Illinois 61832

Succeeding in the World of Work, Kimbrell, Vineyard

McKnight and McKnight Publishing Co.
Bloomington, Illinois

A New Look at Careers in Agriculture (FS)

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93409

Vocational Education in Agriculture--What? Why?

A.V.A.

Agri-Industry Careers

Employment Opportunities for College Graduates in the:

Food and Agricultural Sciences
College of Agriculture
Texas A & M University
College Station, TX 77843

LEADERSHIP UNITS

UNITS

LEADERSHIP THROUGH FFA

LEADERSHIP DEVELOPMENT THROUGH THE USE OF PARLIAMENTARY PROCEDURE

THE ROLE OF THE SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM (SOEP)

TYPES OF SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS (SOEP)

PLANNING AND IMPLEMENTING THE SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM (SOEP)

UNIT -- LEADERSHIP THROUGH FFA

Upon completion of the Leadership Through FFA Unit, the student should be able to:

Write a description of what you can do in FFA and how it relates to a career choice.

List, explain and/or recite the following FFA materials needed to become an FFA member.

a. a short history of the FFA
b. creed
c. motto
d. colors
e. emblem
f. kinds of membership
g. aims and purposes
h. the FFA salute
i. dress code
j. wearing the FFA jacket
k. code of ethics
l. receiving the greenhand degree

Describe how to have a good chapter including:

a. planning--key to good meetings,
b. how to take part in chapter meetings, and
c. what constitutes a chapter program of activities.

List and describe skills necessary to become a chapter leader.

List and describe FFA awards available to members including:

a. star degree awards,
b. public speaking awards,
c. achievement awards,
d. proficiency awards, and
e. other state and local awards.

Identify FFA contests available to members in Montana.

List the requirements for earning the Chapter Farmer, State Farmers and American Farmer Degree.

Explain how the local and state FFA program fits into the national FFA organization.

REFERENCES

Student Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia

Official FFA Manual

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia

UNIT -- LEADERSHIP DEVELOPMENT THROUGH THE USE OF PARLIAMENTARY PROCEDURE

Upon completion of this unit, the student should be able to:

Describe why parliamentary procedure improves a meeting.

Write an order of business for an FFA meeting.

Identify and demonstrate the purpose and use of the gavel.

Identify and demonstrate the steps necessary to bring up and dispose of business properly.

Identify and list motions according to purpose and precedence.

Identify and list the characteristics of the kinds of motions used in conducting a meeting.

Identify and demonstrate the different types of voting procedures used in conducting an FFA meeting.

Identify, explain, and demonstrate the procedures used in the Montana State FFA Parliamentary Procedure contest.

REFERENCES

Student Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia

Workbook for Parliamentary Procedure

Vocational Instructional Services
EE Box 182
Texas A & M University
College Station, TX 77843

Roberts Rules of Order

William Morrow and Company, Inc.
105 Madison Avenue
New York, NY 10016

Montana FFA Contest Bulletin

OPI - Leonard Lombardi
Capitol Building
Helena, MT 59601

A Guide to Parliamentary Practices

Rucker
Interstate Printers and Publishers, Inc.
19-27 North Jackson Street
Danville, Illinois 61832

UNIT -- THE ROLE OF THE SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM (SOEP)

Upon completion of this unit, the student should be able to:

Define an SOE program (SOEP).

Describe the relationship between SOEP and a total program of vocational agriculture.

Identify and list the values of SOEP as it relates to the long range goals of the individual student.

Discuss how SOEP can lead to self-employment or careers in both agribusiness and production agriculture.

Describe how improvement projects and supplemental practices can enhance an SOEP.

REFERENCES

Student Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia 22309

S.O.E. Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia 22309

Amberson and Anderson, Learning Through Experience in Agricultural Industry, McGraw Hill, New York, 1978.

Binkley & Byers, SOE Programs in Agriculture, The Interstate Printers & Publishers, Danville, Illinois, 1984.

Employment Survey - Agricultural & Industrial Education, MSU.

SOEP Video, MSU Agricultural & Industrial Education Department

UNIT -- TYPES OF SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS (SOEP)

Upon completion of this unit, the student should be able to:

Describe the types of SOE programs.

Identify the component parts of each the types of the SOE program.

List and describe a criteria to consider in selecting an appropriate type of SOE program.

Discuss how the major labor and wage laws affect students' employment in agricultural/agribusiness occupations.

Identify the major areas in which agricultural work experience may be planned and carried out.

Identify and select improvement projects for inclusion in the SOE programs.

Identify and select supplementary skills for inclusion in the SOE programs.

Identify opportunities for different types of SOE programs.

Distinguish between production SOE and agribusiness SOE programs.

Describe how to plan for the various types of SOE programs.

REFERENCES

Student Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia 22309

S.O.E. Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia 22309

Amberson and Anderson, Learning Through Experience in Agricultural Industry, McGraw Hill, New York, 1978.

Binkley & Byers, SOE Programs in Agriculture, The Interstate Printers & Publishers, Danville, Illinois, 1984.

UNIT -- PLANNING AND IMPLEMENTING THE SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM (SOEP)

Upon completion of this unit, the student should be able to:

Identify and discuss the purpose and characteristics of SOE plan for an individual student's career objectives.

Plan enterprises for SOE programs.

List some of the sources for financing productive enterprises.

Identify the method of obtaining a loan from a credit source.

Keep all SOE records needed by students for their SOE program on computerized record systems.

Develop a long-range SOE plan with goals.

Establish criteria for evaluating SOE programs.

REFERENCES

Student Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia 22309

S.O.E. Handbook

Future Farmers of America
National FFA Supply Service
P.O. Box 15159
Alexandria, Virginia 22309

Amberson and Anderson, Learning Through Experience in Agricultural Industry, McGraw Hill, New York, 1978.

Binkley & Byers, SOE Programs in Agriculture, The Interstate Publishers & Printers, Danville, Illinois, 1984.

AGRIBUSINESS UNITS

UNITS

AGRIBUSINESS LEADERSHIP

WORKING IN AGRI-BUSINESS

SALES AND SERVICE SKILLS

DISTRIBUTION AND MARKETING

MANAGEMENT, RECORDS AND PROCEDURES

UNIT -- AGRIBUSINESS LEADERSHIP

Upon completion of this unit the student should be able to:

Identify and practice skills essential to good communications.

Develop short and long range business goals.

Develop a time management plan to improve work efficiency.

Develop self-motivation skills for the job.

Identify personal characteristics which enhance work performance.

REFERENCES

Kimbrell & Vineyard, Succeeding in the World of Work, McKnight and McKnight Publishing Co., Bloomington, Illinois.

Stewart, Bob R., Leadership for Agriculture Industry. McGraw-Hill Book Company, New York, NY, 1978.

_____, Personal Characteristics Needed for Successful Employment, Montana State University, Bozeman, MT, 1986. (instructional unit)

UNIT -- WORKING IN AGRI-BUSINESS

Upon completion of this unit, the student should be able to:

Describe and chart the history and development of agriculture and agribusiness.

Describe the traits that make a worker successful.

Complete job applications, letters of application, resumes and personal data inventories.

Develop a time management plan as it relates to work efficiency.

Describe ways to become more resourceful on the job.

REFERENCES

Lee, Jasper, (1978), Working in Agricultural Industry, McGraw-Hill Book Company, New York, NY.

_____, Personal Characteristics Needed for Successful Employment, Montana State University, Bozeman, MT. (instructional unit)

UNIT -- SALES AND SERVICE SKILLS

Upon completion of this unit, the student should be able to:

Identify and practice different characteristics used in sales and service occupations.

Explain the importance of product knowledge.

Demonstrate principles of a good sales presentation.

Prepare sales tickets.

Identify and explain basic business record keeping.

Balance a checkbook using the microcomputer and appropriate software.

Define product promotion and explain what it tries to accomplish.

Identify and use the three main functions of advertising in order to promote a product, supply or service.

List entry-level career opportunities in sales and service.

REFERENCES

Lee, Jasper, (1978), Working in Agricultural Industry, McGraw-Hill Book Company, New York, NY.

Stewart, B.R., (1978), Leadership for Agricultural Industry, McGraw-Hill Book Company, New York, NY.

McGuire, James, (1979), Advertising and Display in Agriculture, McGraw-Hill Book Company, New York, NY.

Miller, L.E., (1979), Selling in Agribusiness, McGraw-Hill Book Company, New York, NY.

UNIT -- DISTRIBUTION AND MARKETING

Upon completion of this unit, the student will be able to:

Explain the role of agricultural supplies and products in the economic system.

Establish a distribution chart.

Describe and use safety procedures in handling agricultural products for distribution.

Describe the methods of transporting agricultural supplies and products.

Describe packaging and its importance to good marketing of agricultural products.

Discuss agricultural processing and its importance in marketing products.

Describe methods and techniques used to market agricultural products.

Discuss the different types of markets available for agricultural products.

REFERENCES

Brown and Oren, (1980), Physical Distribution in Agribusiness, McGraw-Hill Book Company, New York, NY.

UNIT -- MANAGEMENT, RECORDS AND PROCEDURES

Upon completion of this the unit, the student should be able to:

Describe the need for agribusiness management.

List the career opportunities available in agribusiness management.

Explain and use skills needed by agribusiness managers.

Describe managerial decision making processes.

List the steps to follow when developing and carrying out a plan of action including: a) goal setting, b) goal evaluation, c) objectives, d) resource plan and e) implementation.

Develop an organizational chart for an agribusiness.

Describe and demonstrate common business procedures in agribusinesses.

Describe and practice important communications procedures in agribusinesses.

Describe and use computer data base to record and calculate basic records for agribusinesses including: a) inventories, b) journals, c) financial statements, and d) cash flow.

Use proper billing procedures as they relate to agribusinesses.

List and describe the four major types of business organizations.

REFERENCES

Lee, D.W. & Lee, J.S., (1980), Agribusiness Procedures and Records, McGraw-Hill Book Company, New York, NY.

Montana Record Book

MECHANICS UNITS

UNITS

SHOP MANAGEMENT AND SAFETY

AGRICULTURAL MECHANICS DRAWING AND SKETCHING

USE OF HAND TOOLS IN AGRICULTURAL MECHANICS

HARDWARE IN AGRICULTURAL MECHANICS

BASIC CARPENTRY AND CONSTRUCTION

HOT METAL AGRICULTURAL MECHANICS SKILLS

COLD METAL IN AGRICULTURAL MECHANICS

ARC WELDING IN AGRICULTURAL MECHANICS

OXYACETYLENE WELDING IN AGRICULTURAL MECHANICS

TRACTOR AND MACHINERY OPERATION AND SAFETY

BASIC ELECTRICITY IN AGRICULTURAL MECHANICS

SMALL GAS ENGINES IN AGRICULTURAL MECHANICS

CAREERS IN AGRICULTURAL MECHANICS

UNIT -- SHOP MANAGEMENT AND SAFETY

Upon completion of the Shop Management and Safety Unit, the student will be able to:

Demonstrate safe use of hand tools in the Ag Mechanics shop.

Demonstrate safe use of power tools in the Ag Mechanics shop.

Work in the Ag Mechanics shop in a safe manner.

Identify safety hazards in the shop and report them to the instructor.

List practices to keep a shop clean, organized and safe.

Describe and demonstrate the use and location of safety equipment such as safety glasses, first aid station, fire blanket, fire extinguishers, and fire exits.

Follow shop rules as outlined by the instructor and equipment manufacturers.

Pass all comprehensive shop safety test with a 100% score.

Pass individual safety tests on the use of shop tools and equipment.

REFERENCES

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed., 1983.

Developing Shop Safety Skills, AAVIM, 1981.

Power Tool Safety and Operation, Hobar Publications, 1973, with instructors packet.

Safety Exams, Hobar Publications

Ag Safety, John Deere

Film, Safetytudes, TIDMA

UNIT -- AGRICULTURAL MECHANICS DRAWING AND SKETCHING

Upon completion of this Drawing and Sketching Unit, the student will be able to:

List the reasons for and demonstrate an understanding of the use of blueprints.

Read a scale ruler.

List and describe the basic elements of a working drawing.

Read and interpret a blueprint.

Properly draw the three views of an orthographic drawing.

Identify and reproduce the common type of lines used in a blueprint or working drawing.

Explain and use abbreviations in drawing and sketching.

Use drawing equipment properly such as: a) scale rule, b) compass, c) dividers, d) curves, e) T-square, f) triangles, and g) protractor.

Draw simple three-view sketches of small objects to be constructed.

Use CAD Draw or similar micro computer drawing programs.

Calculate area in square feet of the floor, walls, roof, windows, doors; cubic feet of footings, foundations, and building interiors from a blueprint or construction plan.

Determine a bill of materials from a blueprint or construction plan.

Convert actual measures to commonly used scale measurement.

Explain the importance of and demonstrate the use of proper blueprint lettering.

Demonstrate proper dimensioning.

Calculate an order and cutting bill of material from a sketch or drawing.

REFERENCES

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed., 1983.

Walker, Exploring Drafting, Goodheart-wilcox, 1978.

CAD Draw-Computer Software.

UNIT -- USE OF HAND TOOLS IN AGRICULTURAL MECHANICS

Upon completion of the Hand Tools Unit, the student should be able to:

Identify and use the various hand tools common in agricultural mechanics.

Select tools of the proper size for various operations.

Select grinding wheels of various grades and grains.

Test grinding wheels for flaws.

Install grinding wheels on grinders.

True a grinding wheel using a wheel dresser.

Select metal saw blades for various cutting operations.

Install hand hack saw blades.

Select sandpaper and sanding belts according to grit.

Demonstrate proper use of hand tools.

Properly clean and store tools.

Fit wooden handles.

Sharpen and/or repair the following shop hand tools:

a. metal and wood saws	f. wood chisels	k. axes
b. hammers	g. metal chisels	l. knives
c. drill bits	h. pliers	m. wrenches
d. planes	i. screwdrivers	n. squares
e. files	j. punches	o. tin snips

REFERENCES

Phipps, Mechanics In Agriculture, Interstate, 3rd Ed., 1983.

Shop Tools, John Deere Service Publications, 1973.

Shinn-Weston, Working in Agricultural Mechanics, McGraw Hill, 1978.

Tool Use, Conditioning, Materials, and Products, Agricultural and Industrial Education, Montana State University, 1976.

UNIT -- HARDWARE IN AGRICULTURAL MECHANICS

Upon completion of the Hardware Unit, the student should be able to:

Correctly identify hardware such as:

a. wood screws
b. bolts
c. metal screws
d. nails
e. washers
f. staples
g. chains
h. springs
i. bearings
j. hinges
k. rivets
l. pulleys
m. plumbing units
n. electrical units
o. braces
p. allen screws
q. keys
r. pipe fittings
s. copper fittings
t. other items

Describe where the various types of hardware items would be used.

Demonstrate the ability to properly order hardware items listed above.

REFERENCES

Hardware Identification Kit, Interstate.

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed.,(1983).

Fasteners, John Deere Service Publication, 1974.

UNIT -- BASIC CARPENTRY AND CONSTRUCTION

Upon completion of this Basic Carpentry and Construction Unit, the student will be able to:

Identify hand and power tools used in carpentry and construction.

Use layout and squaring tools.

Square a board and make a square cut to specifications with crosscut hand saw.

Identify common types of circular saw blades.

Square a board and make a square cut to specifications with portable circular saw.

Cut accurate holes with a hand brace and bit.

Select proper bits and drills for a given size hole.

Use hammers to nail and toenail.

Identify kinds of wood used for lumber.

Identify common types of lumber.

Prepare an order bill and cutting bill of materials.

Calculate board feet, running feet, square feet, and cubic feet.

Calculate cost of a given quantity of lumber based on standard pricing systems.

Use wood screws to join wood.

Use screw mates or countersinks to place wood screws.

Construct a small project using wood.

Identify purpose of finishing projects. (sanding, painting, etc.)

Select paints, stains, varnishes, or other finishes for application.

Prepare surfaces to receive a finish.

Apply finishes with a brush, foam applicator or spray can.

Clean, secure, and store equipment used in finishing.

Identify types and uses of paint brushes.

Define terms associated with painting and finishing.

Evaluate the workmanship on a finished product.

Smooth material with hand planes.

Drive and clinch nails properly.

Remove nails properly using proper hand tools.

Use a framing square to lay out angles.

Identify common building parts.

Layout common rafters and truss rafters.

Layout stairs.

Demonstrate the proper procedure for gluing wood.

Demonstrate the proper use of a table saw and pass an approved safety test.

Demonstrate the proper use of the radial arm saw and pass an approved safety test.

REFERENCES

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed.,(1983).

Resource Unit on Agricultural Construction, Agricultural and Industrial Education, Montana State University.

Midwest Plan Service Structures and Environment Handbook, Iowa State Univ.. Extension Agricultural Engineer, 1980.

Wakeman, Modern Agricultural Mechanics, Interstate, 1977.

Capotosto, Basic Carpentry, Reston Publishing Co., 1980.

Hammond, Donnelly, Harrod, and Rayner, Woodworking Technology, McKnight Publishing Company , 1980.

UNIT -- HOT METAL AGRICULTURAL MECHANICS SKILLS

Upon completion of the Agricultural Mechanic Skills Unit, the student will be able to:

Identify the tools used in hot metal work.

Identify types of solder and fluxes and list their components.

Prepare metal for soldering.

Identify types and application of different heat sources.

Tin a soldering copper, iron or gun.

Select proper solder for the job.

Cut and debur copper tubing with a hand cutter.

Sweat copper tubing.

Identify and solder copper fittings and joints.

Solder tin and galvanized metal.

Identify and demonstrate sweat soldering versus seam soldering.

Solder electrical wires.

Demonstrate the ability to properly heat metal.

Properly temper steel.

Properly anneal steel.

Properly harden steel.

Demonstrate the use of spot welders.

Identify and demonstrate the use of silver solder.

Use the anvil for bending metal.

REFERENCES

Resource Unit on Agricultural Mechanics Skills, Agricultural and Industrial Education, Montana State University, 1976.

Wakeman, Modern Agricultural Mechanics, Interstate, 1977.

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed.,(1983).

UNIT -- COLD METAL IN AGRICULTURAL MECHANICS

Upon completion of the Cold Metal Unit, the student will be able to:

Identify tools used in cold metal work.

List ways of cutting cold metal.

Cut metal properly using a cold chisel.

Cut metal properly using a hack saw.

List steps used in bending cold metal.

Use the drill press properly to dill a hole in metal.

Use taps and dies to properly thread bolts and nuts.

Identify the classification of threads used on bolts.

Discuss bolt hardness classification.

Complete a small cold metal project.

Identify the different types of pipe.

Identify common pipe fittings.

List reasons for using threading compound.

Describe how pipe and bolts are measured in order to determine diameter.

List the common sizes of steel pipe.

Distinguish between pipe and bolt threads.

Describe the properties of metal to include: a) hardness, b) malleable, and c) ductile.

Distinguish between ferrous and non-ferrous metal.

Demonstrate correct use of files.

Attach metal with iron rivets and pop rivets.

Identify tools used in laying out sheet metal.

Measure and mark sheet metal.

Cut sheet metal with tin snips.

Bend and shape sheet metal.

Construct small sheet metal projects.

Demonstrate the proper use of the metal band saw.

Demonstrate the proper use of the cut-off saw.

REFERENCES

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed.,(1983).

Shinn, Weston, Working in Agricultural Mechanics, McGraw Hill, 1978.

Wakeman, Modern Agricultural Mechanics, Interstate, 1977.

Blankenbaker, Modern Plumbing, Goodheart-Wilcox, 1978.

UNIT -- ARC WELDING IN AGRICULTURAL MECHANICS

Upon completion of this Arc Welding Unit, the student will be able to:

Define terms associated with arc welding.

List the kinds of arc welders and their characteristics.

Identify and describe MIG, TIG and shielded arc welding processes.

Follow safety procedures when arc welding and pass arc welding safety test with 100% score.

List equipment and materials needed for arc welding.

List and describe the variables that determine weld quality.

Identify the meanings of the numbers in the AWS electrode classification.

Identify welding positions, weld joints and welding symbols.

List factors that determine welder current setting.

Discuss factors that determine amperage setting.

Identify characteristics of poor welds.

Select proper type and size of electrode for each of the jobs.

Label the parts of a weld.

Distinguish between AC and DC welding.

Demonstrate safety with the arc welder.

Discuss characteristics of proper arc length.

Properly start, stop and restart and bead.

Identify the various welding joints.

Identify the various welding positions.

Prepare metal for arc welding.

Run a continuous arc bead.

Make a welding pad in the flat position.

Complete a V-butt weld in the flat position.

Complete a lap weld in the flat position.

Prepare heavy metal for welding.

REFERENCES

Resource Unit on Agricultural Welding, Agricultural and Industrial Education, Montana State University.

Wakeman, Modern Agricultural Mechanics, Interstate, 1977.

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed.,(1983).

Giachino, Weeks, Johnson, Welding Technology, American Tech. Society, 1975.

Shinn, Weston, Working in Agricultural Mechanics, McGraw Hill, 1978.

UNIT -- OXYACETYLENE WELDING IN AGRICULTURAL MECHANICS

Upon completion of this Oxyacetylene Welding Unit, the student will be able to:

Demonstrate and pass a test with 100% on safety using oxyacetylene equipment.

Label parts of oxyacetylene equipment.

Define terms associated with oxyacetylene welding and cutting.

Identify and describe types of flames in oxyacetylene welding.

Properly turn on, name parts of and adjust the flame.

Properly turn off the oxyacetylene equipment.

Define the terms flashback and backfire.

List causes of flashback and backfire.

Distinguish between brazing and fusion welding.

List advantages and disadvantages of brazing.

Prepare and clean the metal surface prior to welding.

List the purposes of flux.

Name the properties of a good weld.

Select proper tip size for welding.

Select the proper size and type of filler rod.

Properly make 90 degree cuts in mild steel.

Make a corner weld without filler rod.

Lay beads on a flat plate with or without filler rod.

Make a flat butt weld using a filler rod.

Construct a filler weld in the flat position.

Construct a lap weld in the flat position.

Make a brazing butt weld joint.

Assemble and disassemble acetylene equipment properly.

Pass a safety test on the use of the acetylene welder.

Identify the various welding joints.

Identify the various welding positions.

Make a brazing lap weld joint.

Make a brazing filler weld joint.

Identify other gases available for welding.

REFERENCES

Resource Unit on Agricultural Welding, Agriculture and Industrial Education, Montana State University.

Shinn, Weston, Working in Agricultural Mechanics, McGraw Hill, 1978.

Phipps, Mechanics in Agriculture, Interstate, 3rd Ed.,(1983).

Wakeman, Modern Agricultural Mechanics, Interstate, 1977.

Giachino, Weeks, Johnson, Welding Technology, American Technical Society, 1975.

UNIT -- TRACTOR AND MACHINERY OPERATION AND SAFETY

Upon completion of the Tractor and Machinery Operation and Safety Unit, the student will be able to:

Discuss the importance of safety when operating tractors and machinery.

Recognize and understand the use of the SMV emblem.

Demonstrate the use of the instrument panel.

Discuss the importance of following the operator's manual.

Locate key parts of a tractor.

Do a pre-operational safety check on diesel and gasoline tractors.

Check the crankcase oil level.

Service air cleaner for gasoline and diesel engines.

Check and service the cooling system.

Service the battery and describe how current is produced through the reaction between active materials on plates in a battery and sulfuric acid.

Service gasoline and diesel fuel filter system.

List safety precautions to follow when gasoline and diesel refueling.

Properly start and stop a gasoline and diesel tractor engine.

Adjust tractor brakes for field or highway operation.

Check and service the tires and steering.

Properly start and stop tractor movement.

Use brakes for making turns.

Maneuver the tractor through a prescribed course.

Properly maneuver a tractor while backing.

Name the safe methods of getting a tractor out of a mud hole.

List safety measures for operating a tractor on a highway.

Describe safety precautions to follow when hitching and unhitching equipment to a tractor.

Describe driving a tractor on rough ground, on side hills and steep slopes.

Discuss safe use of a power take-off.

Describe matching gear selection and engine speed with load.

Discuss the importance of shields and guards on tractors and machinery.

Discuss the importance of ventilation to prevent carbon monoxide poisoning.

Discuss the important of lubrication and maintenance of farm equipment.

Pass an approved driving test.

REFERENCES

Safe Operation of Agricultural Equipment, Hobar Publications.

Safe Tractor Operation and Daily Care, AAVIM, 1981.

Illinois Tractor Safety Unit.

UNIT -- BASIC ELECTRICITY IN AGRICULTURAL MECHANICS

Upon completion of the Basic Electricity Unit, the student will be able to:

Define electrical terms.

Identify electrical tools and hardware.

Explain electrical flow, pressure, power, and resistance in relation to amperage, voltage, wattage and ohms.

Discuss the electron theory.

List and demonstrate ways electricity is produced.

List and demonstrate safety practices associated with electricity.

Identify the uses of electricity.

Identify and describe the functions of fuses, GFIs, breakers, conductors and insulators.

Use Ohm's Law to calculate amperage, voltage and resistance.

Use a voltmeter, ampmeter and ohmmeter to measure electricity.

Identify factors that cause excessive resistance to electrical flow.

Read all types of electric utility meters.

Distinguish between a parallel and series circuits and explain control devices for each.

Diagram wiring circuits.

Identify electrical units.

Use basic wiring procedures and tools correctly and safely.

Identify different types of electrical wire.

Tie the underwriter's knot.

Wire an electrical plug.

Wire a light controlled by a single pole switch.

Wire a light controlled by two three-way switches.

Wire a thermostat to a heater unit.

Wire a time control to an electric motor.

Splice electrical wires and use solderless connectors.

Identify the parts of and wire a service entrance panel.

Calculate wire size requirements for the load size.

Wire 240V circuits from SEP to load.

Explain and describe HP conversion from internal combustion engines to electric motors.

Construct a simple electric motor.

Identify and wire electric motor sensing devices and controls.

REFERENCES

Resource Unit on Agricultural Electricity, Agricultural and Industrial Education, Montana State University, 1976.

Understanding Electricity and Electrical Terms, AAVIM, 1981.

Maintaining the lIghting and Wiring System, AAVIM, 1980.

Mix, House Wiring simplified, Goodheart-Wilcox, 1981.

Electrical Motor Sensing Devises and Controls, Montana State University.

UNIT -- SMALL GAS ENGINES IN AGRICULTURAL MECHANICS

Upon completion of the Small Gas Engine Unit, the student will be able to:

Define terms associated with small engines.

Solve problems concerning force, work, power and energy.

Explain the principle of the conversion of chemical energy to mechanical energy.

Identify the basic operating positions on small gas engines.

Distinguish between 2-stroke cycle engines and 4-stroke cycle engines.

List the four main events in the operation of a four-cycle engine.

List advantages and disadvantages of an air-cooled engine.

Test compressions of a small gas engine and discuss pressure/volume relationships.

Explain the importance of a proper air/fuel ratio for efficient fuel combustion.

Disassemble a small gas engine and clean parts.

Identify parts of a small gas engine.

Identify and use tools associated with repairing small engines.

Accurately read and us a micrometer, caliper, feeder gage, small hole gage, large hole gage, compression gage, and plasti-gage.

Measure parts and compare with rejection sizes.

Use a torque wrench.

Order replacement parts for a small gas engine.

Reassemble a small gas engine in proper sequence.

Trouble-shoot a small gas engine.

Make adjustments for proper operation of a small gas engine.

Clean and service spark plugs on small gas engines.

Select proper fuels and lubricants for small engines.

Explain how the heat of compression ignites diesel fuel.

Explain why fuel must be atomized and vaporized for proper combustion.

REFERENCES

Repair Instruction, Briggs and Stratton Corp., Milwaukee, WI.

Roth, Small Gas Engines, Goodheart-Wilcox, 1975.

Crouse, Anglin, Small Engine Mechanics, McGraw Hill, 1980.

Air-Cooled Engine Mechanics Training Manual, Engine Service Association, Milwaukee, WI 1974.

Power Shop Technical Manuals, Hobar Publications.

Maintenance and Repair of Small Engines, AAVIM, 1979.

UNIT -- CAREERS IN AGRICULTURAL MECHANICS

Upon completion of this Careers in Agricultural Mechanics Unit, the student will be able to:

List career opportunities in the local area in welding, small engines, electricity, building construction, tractor and equipment and metals.

List and describe career opportunities in sales and service associated with tools, hardware, and supplies.

List the competencies and requirements needed to enter specific careers in Ag Mechanics.

REFERENCES

Shinn, Weston, Working in Agricultural Mechanics, McGraw Hill, 1978.

Hoover, Handbook on Agricultural Occupations, Interstate, 1977.

ANIMAL SCIENCE UNITS

UNITS

INTRODUCTION TO ANIMAL SCIENCE

SELECTION OF LIVESTOCK FOR BREEDING AND FATTENING

CAREER AND MANAGEMENT OF LIVESTOCK FOR BREEDING AND FATTENING

SELECTING LIVESTOCK FOR PRODUCTION PROJECTS

GENERAL ANIMAL FEEDING

GENERAL ANIMAL HEALTH AND CARE

APPROVED PRACTICES FOR RAISING LIVESTOCK

UNIT -- INTRODUCTION TO ANIMAL SCIENCE

Upon completion of the Introduction to Animal Science Unit, the student should be able to:

Define terms associated with the livestock industry.

Explain the basic production and distribution cycle for livestock.

Name the five (5) primary classes of animals grown in Montana.

Determine the total numbers of beef, sheep, swine, dairy and horses in Montana.

List and discuss the job opportunities associated with the livestock industry.

Explain the importance of the livestock industry in the local community, state, and nation.

Recognize trends in livestock production for local area, state, and nation.

Estimate the value of all livestock produced on home farm, county, state, and nation.

Describe the characteristics and original breeds of: a) beef cattle, b) sheep, c) swine and d) dairy, common to the state of Montana.

Identify the major parts of beef, sheep, swine, dairy and horses.

Explain the functions of reproduction, circulatory, respiratory, and digestive systems of animals.

Define the terms and principles of genetics common to animal science.

Discuss the effect genetics has on the production potential of all farm animals.

Draw or discuss the development of the fetus from time of conception until time of birth.

Discuss the importance of keeping livestock records including: a) 205 day weaning weight, b) birth weight, c) important ratios and d) rate of gain.

Use a microcomputer to analyze records and provide information to make management decisions.

Identify jobs and discuss career opportunities involved in the animal science industry.

Describe how the animal science industry is interrelated to and dependent upon agribusiness.

REFERENCES

Blakely and Bade, The Science of Animal Husbandry, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Ensminger, M.E., The Stockman's Handbook, (5th Ed), The Interstate Publisher, Danville, Illinois.

Stufflebeam, Charles E., Principles of Animal Agriculture, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1983.

Merck's Veterinary Manual

Extension Service Bulletins

UNIT - SELECTION OF LIVESTOCK FOR BREEDING AND FATTENING

Upon completion of the Section of Livestock for Breeding and Fattening Unit, the student should be able to:

Identify those animals which appear to have superior inheritance for selected traits as determined by records presented on the ancestors.

Distinguish those animals that are superior according to a combination of type, pedigree, and production testing selection procedures.

Distinguish those animals that are superior according to a phenotypic or type selection process as determined by market demands.

List and identify terms associated with the breeding livestock industry.

Explain IPR testing and describe a test program.

Discuss the importance of heredity as it applies to selecting breeding mates.

Discuss the effects of dominant and recessive genes as it applies to a breeding program.

Explain the advantages and disadvantages of different breeding techniques and discuss the evaluation of progeny from those breeding systems.

Identify wholesale and retail cuts of meat from the different animal species.

Describe carcass evaluation in relationship to selection of market animals.

List and explain terms associated with market animals.

Discuss and practice live grading of feeder cattle.

Investigate and discuss new trends in breeding techniques, i.e., embryo transplant and pre-fetal steroid injections.

Describe carcass grades in relation to market prices.

Make selections of breeding animals based on computer printout information and records.

REFERENCES

Blakely and Bade, The Science of Animal Husbandry, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Ensminger, M.E., The Stockman's Handbook, (5th Ed), The Interstate Publisher, Danville, Illinois.

UNIT -- CARE AND MANAGEMENT OF LIVESTOCK FOR BREEDING AND FATTENING

Upon completion of the Care and Management of Livestock for Breeding and Fattening Unit, the student should be able to:

Identify approved practices for handling female breeding stock.

List the major breeding systems and discuss their advantages and disadvantages to help a breeder select the appropriate system to meet his/her needs.

Describe the proper environment for and feeding of the female animal of various species during gestation.

Identify recommended breeding age and amount of service for male breeding animals of the various animal species.

For each species of animals, determine age of puberty, determine the estrus cycle and breeding cycle, and length of gestation.

Describe signs of approaching parturition for common farm animals.

Discuss the advantages and disadvantages of artificial insemination in beef and dairy cattle and methods used.

Discuss the procedure and advantages of fertility and pregnancy testing.

List and explain the recommended practices to be used when handling newborn animals of various species.

List, diagram and/or describe proper handling facilities, shelters, housing, and use of feeding and watering equipment and systems.

Identify factors in sanitation and disease control and prevention associated with breeding animal enterprises.

Identify recommended methods to prevent livestock losses associated with breeding animal enterprises.

Describe the best way to raise orphan animals.

Demonstrate the ability to handle newborn animals and their mothers.

Describe the basic housing needed for various species of breeding livestock.

List and identify individual characteristics which will enable market animals to meet current demands in the livestock industry.

Identify, diagram, and/or describe facilities, equipment, housing and shelters associated with the market animal industry.

Identify and discuss methods to increase weight gains and feed efficiencies.

Identify the factors in animal sanitation and disease prevention and control associated with market animals.

Identify recommended methods to prevent livestock losses in handling and shipping.

Describe and demonstrate the precautions to take in handling livestock during transit.

List and explain terms associated with the market livestock industry.

Determine adjusted weaning weights.

Determine the efficiency of gain of livestock.

Determine dressing percentages of livestock.

Calculate shrinkage resulting from shipping and handling.

Describe and calculate herd ration including: a) nursing ratio, and b) gain.

REFERENCES

Blakely and Bade, The Science of Animal Husbandry, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Ensminger, M.E., The Stockman's Handbook, (5th Ed), The Interstate Publisher, Danville, Illinois.

Stufflebeam,, Charles E., Principles of Animal Agriculture, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1983.

UNIT -- SELECTING LIVESTOCK FOR PRODUCTION PROJECTS

Upon completion of the Selecting Livestock for Production Projects unit, the student should be able to:

Recognize factors affecting the location of major livestock enterprises in the state and nation.

Select livestock enterprises for home farm.

Identify factors affecting enterprises selection for S.O.E.P.

Identify FFA proficiency award areas and complete proper forms and applications.

REFERENCES

Amberson and Anderson, Learning Through Experience in Agricultural Industry, McGraw Hill, New York, 1978.

_____, Handbook for Supervised Occupational Experience, National FFA Supply Center, Alexandria, Virginia, 1982.

UNIT -- GENERAL ANIMAL FEEDING

Upon completion of the General Animal Feeding Unit, the student should be able to:

Compare and associate feed costs with the total cost involved in livestock production.

Discuss the four uses livestock make of their feed.

List and give examples of the three general classes of foodstuffs for livestock.

Discuss practices by the might improve feed efficiency.

List the common classifications of feed nutrients.

Discuss the functions of carbohydrates, fats, protein, minerals, and vitamins and water in an animal's diet.

Explain the importance of a balance of nutrients in animal growth and development.

Explain the difference between roughages, concentrates and supplements.

List those factors that should be considered when determining the most economical feed.

List factors to be considered when formulating a ration.

Identify common sources of major feed nutrients.

Describe the various processes for preparing feed for livestock.

Discuss the storage and transportation of livestock feeds.

Identify those factors that must be considered when determining the most economical feed to feed.

Calculate the total cost of a livestock ration.

Identify those factors to consider when formulating a ration.

Balance a simple ration for livestock.

Use a microcomputer to evaluate and balance simple rations.

REFERENCES

Blakely and Bade, The Science of Animal Husbandry, (2nd Ed), Reston Publishing Co., In., Reston, Virginia, 1979.

Cullison, Arthur E., Feeds and Feeding, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Stufflebeam, Charles E., Principles of Animal Agriculture, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1983.

UNIT -- GENERAL ANIMAL HEALTH AND CARE

Upon completion of the General Animal Health and Care Unit, the student should be able to:

List and describe both visual and non-visual indicators of animal health.

Define the common terms related to animal health.

Describe the characteristics of and suggest how to prevent and/or control infectious and non-infectious diseases of beef cattle, sheep, swine, dairy and horses common to Montana.

Describe how plant diseases cause losses in livestock.

Identify major disease-producing organism for those livestock disease common to the area.

Name the three types of immunity and give examples of each.

List the precautions to be taken in purchasing, selling and shipping disease-free animals.

Explain the quarantine procedure for livestock.

Develop a yearly animal health program for all types of livestock.

Identify signs of good animal health.

List the average temperature range for livestock and poultry.

Discuss several factors that constitute a good sanitation program.

Identify and administer the four kinds of injections.

Discuss common diseases of each class of livestock and explain the symptoms, treatment and control of each disease.

Identify proper procedures for care, use, storage and disposal of medications used to treat animals.

Identify all information needed when calling a veterinarian about a sick animal.

Identify the agencies that monitor animal health.

List, explain and demonstrate proper procedures for implanting of growth stimulants.

REFERENCES

Blakely and Bade, The Science of Animal Husbandry, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Ensminger, M.E., The Stockman's Handbook, (5th Ed), The Interstate Publisher, Danville, Illinois.

Stufflebeam, Charles E., Principles of Animal Agriculture, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1983.

Siegmund, O. H., The Merck Veterinary Manual, (5th Ed.), Merck & Co. Inc., Rahway, N.J., 1979.

UNIT -- APPROVED PRACTICES FOR RAISING LIVESTOCK

Upon completion of the Approved Practices for Raising Livestock Unit, the student should be able to:

List, explain and demonstrate the common methods of branding, tattooing and ear-tagging appropriate to the different species of livestock.

List, explain and demonstrate the methods of dehorning, castrating, and docking appropriate to the different species of livestock.

List, explain and demonstrate the methods of clipping animals, and trimming feet of livestock.

Outline and demonstrate the proper procedure for training and preparing an animal for show.

Record animal weights to determine growth rates.

REFERENCES

Blakely and Bade, The Science of Animal Husbandry, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Ensminger, M. E., The Stockman's Handbook, (5th Ed), The Interstate Publisher, Danville, Illinois.

SPECIAL REFERENCES FOR ANIMAL SCIENCE

INTRODUCTION TO ANIMAL SCIENCE:

Books

Blakely, James and David H. Bade, The Science of Animal Husbandry, (2nd Ed), 1979, Reston Publishing Co., Inc., Reston, Virginia. Prentice-Hall Co.

Peterson-Christensen-Nelson, Working in Animal Science, 1978, Greg OG Division, McGraw Hill Book Company.

Ensmiger, M. E., Animal Science, (7th Ed), 1977, The Interstate Printers and Publishers, Inc., Danville, Illinois.

Ensminger, M. E., The Stockman's Handbook (5th Ed), 1978, The Interstate Printers and Publishers, Inc., Danville, Illinois.

Stufflebeam, Charles E., Principles of Animal Science, Prentice-Hall, Inc.,Englewood Cliffs, N.J., 1983.

Cullison, Arthur E., Feeds and Feeding, (2nd Ed), Reston Publishing Co., Inc., Reston, Virginia, 1979.

Higgs, Heidenreich, Loberger, Cropp and Mitchell, Agricultural Mathematics, The Interstate Printers and Publishers, Inc., Danville, Illinois, 1981.

Amberson and Anderson, Learning Through Experience in Agricultural Industry, McGraw-Hill, New York, 1978.

_____, Handbook for Supervised Occupational Experience, National FFA Supply Center, Alexandria, Virginia, 1982.

Animal Science Resource Unit, Introduction/Selection, Dec. 1975. Ag and Industrial Ed., MSU, Bozeman, MT (A complete list of references within.)

Basic Principles of Animal Science, 1976. A reference unit for teaching basic principles. Mississippi State University Research and Curriculum Unit, P.O. Drawer DX, Mississippi State, MS, 39762.

GTA Manuals

Filmstrips/Slides, Etc.

Pre-natal Development of the Calf (FS)

Vocational Education Productions
California State Polytechnic University
San Luis Obispo, CA 93407

Beef Breeds of North America (Poster)

Better Beef Business
P.O. Box 20205
Kansas City, MO 64195 Phone: (816) 431-2333

MANAGEMENT OF BREEDING ANIMALS (In addition to references already stated)

Juergenson, Elwood M., Handbook of Livestock Equipment, (2nd Ed), 1979, The Interstate Printers and Publishers, Inc., Danville, Illinois.

Other

Planning Fences (Reference Bulletin) 1980

AAVIM
Engineering Center
Athens, Georgia

Private Water Systems (Reference Bulletin) 1975

Midwest Plan Service

Sheep Handbook)
Beef Handbook)
Dairy Handbook) FS
Swine Handbook)
Planning Grain -- Feed Handling)

Midwest Plan Service
122 Davidson Hall
ISU
Ames, Iowa 50011

Cow-Calf Production (FS)

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407

The Brood Sow and Litter (FS)

Vocational Education Production
California Polytechnic State University
San Luis Obispo, CA 93407

MANAGEMENT OF MARKET ANIMALS (In addition to references already stated)

Feed lot Production (FS)

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407

APPROVED PRACTICES FOR LIVESTOCK

	Other
Beef Cattle Castration	)
Sheep Castration	)
Docking Sheep	) FS
Fitting and Showing Sheep	)
Basic Sheep Handling Skills	)

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407

PLANT SCIENCE UNITS

UNITS

PLANT GROWTH AND REPRODUCTION

BASIC SOILS

SOIL CONSERVATION AND EROSION CONTROL

SOIL FERTILITY AND FERTILIZERS

FIELD CROP MANAGEMENT

RANGE MANAGEMENT

BASIC HORTICULTURE

CROP PEST MANAGEMENT

AGRICULTURAL CHEMICALS

CAREER OPPORTUNITIES IN PLANT SCIENCE

UNIT -- PLANT GROWTH AND REPRODUCTION

Upon completion of the Plant Growth and Reproduction Unit, the student should be able to:

Identify and list the functions of the major plant parts and explain the conditions necessary for plant growth with respect to size, shape, structure, needs, reproduction and use.

Distinguish between monocotyledon and dicotyledon plants.

Classify and identify plants according to their roots, stems, leaves and flowers.

Use a microscope and other science lab equipment to identify parts of plant cells and calculate plant growth development.

Explain the terms and theories which describe plant propagation.

Describe environmental factors that affect seed germination and plant growth.

Using science lab techniques, demonstrate how duration and quality of light influences reproduction of plants.

Use appropriate equipment and investigative research to define and describe:

a. the photosynthesis process
b. the process of transpiration
c. the process of respiration
d. the process of osmosis
e. the plants life cycle.

Demonstrate the different breeding techniques used in plant reproduction for both sexual and asexual plants.

Explain how plants are classified by life cycles to include: a) annual, b) biennial, and c) perennial.

Describe four methods used to classify plants to include: a) similarity of function, b) life cycle, c) similarity of structure, and d) scientific classification.

Describe the four plant phyla to include: a) Thallophyte, b) Bryophyte, c) Pteridophyte and d) Spermatopyte.

Discuss the necessity for a scientific plant classification system.

Describe: a) how growth occurs in the plant and b) the characteristics which enable plants to survive.

Explain seed and plant dormancy.

PLANT GROWTH AND REPRODUCTION (Continued)

Conduct library investigations to match terms and definitions associated with plant growth and reproduction.

REFERENCES

Bishop, Carter, Chapman and Bennett, Crop Science and Food Production, McGraw-Hill Book Company, 1983

Galston-Davis-Sotter, The Life of the Green Plant, Prentice Hall, 1980

Hartmann-Flocker-Kofranek, Plant Science Growth, Development and Utilization of Cultivated Plants,, Prentice Hall, 1981.

Agricultural Education Software

Soil Improvement Comm. - Cal. Fert. Assn.

Western Fertilizer Handbook, Interstate 1985.

Software - Sexual Plant Propagation - Agricultural Education.

UNIT -- BASIC SOILS

Upon completion of the Basic Soils Unit, the students will be able to:

Examine and define soil.

Under field conditions observe and describe how rocks, soil, water and air are important to good crop production.

Use a soil high in organic matter to demonstrate its importance in maintaining soil conditions.

Use science laboratory equipment to show soil permeability and the conditions that affect it.

Describe the physical properties of soil:

a) mineral component
b) organic component
c) biotic component

Use a soil triangle and texture testing techniques to describe and identify the three basic soil texture: a) sand, b) silt, and c) clay.

Use lab equipment to compare weight and mass of the soil texture classes.

Under field conditions, identify a soil profile.

Describe the benefits of organic and inorganic matter in the soil.

a) Show how microorganisms can produce food and energy for plants.
b) Using library investigation and field trips, describe soil management

Describe how the water cycle is important to good soil management.

Observe several soil profiles and distinguish between good soil structure and poor soil structure.

Identify and describe the major soil structures to include: a) platy, b) prism like, and c) block like.

Demonstrate the use and maintenance of equipment used to correct alkali areas.

Examine and define saline and sodic soils.

Demonstrate the procedures to correct saline and sodic soils.

Use litmus paper to determine pH and define its characteristics.

REFERENCES

Sopher-Baird, Solid and Soil Management, Reston Publishing Company, 1978.

Knuti-Korpi-Hide, Profitable Soil Management, Prentice Hall, 1962.

Soils, Ag and Industrial Education, Montana State University, 1975.

Bishop, Carter, Chapman, and Bennett, Crop Science and Food Production, McGraw Hill Book Company, 1983.

UNIT -- SOIL CONSERVATION AND EROSION CONTROL

Upon completion of the Soil Conservation and Erosion Control Unit, the student will be able to:

Investigate and define erosion and describe its effect on the earth's surface.

List the major types of erosion including: a) wind erosion, b) water erosion and c) chemical erosion.

Demonstrate and describe conservation practices effective in reducing a) wind erosion, b) water erosion and c) chemical erosion.

Plan cropping systems to match degree of erosion hazards.

List and describe the eight land capability classes according to proper land use.

Name and put into practice the six factors used in determining the land capability class.

Use a county land use plan and land classification system to identify specific land capabilities and develop a conservation plan.

Investigate and describe the various conservation systems to include: a) contour tillage, b) strip-cropping and c) terracing.

Survey the community to identify specific examples of poor conservation practices.

Calculate soil "topsoil" loss tolerance.

Identify state and federal programs available to assist owners in erosion control.

REFERENCES

Bosworth-Foster, Approved Practices in Soil Conservation, Interstate Printers and Publishers, 1982.

U.S.D.A. Soil Conservation Service, Land Capability Classification, Agriculture Handbook #210.

Montana Land Judging Manual, Extension Service, Montana State University.

UNIT -- SOIL FERTILITY AND FERTILIZERS

Upon completion of the Soil Fertility and Fertilizers Unit, the student will be able to:

Briefly describe the function of the 16 mineral elements needed by plants to promote proper growth.

Define macro, secondary and micro plant nutrients.

Discuss availability of nutrients in the major types of soil.

Identify nutrient deficiency symptoms in growing crops.

Use litmus paper to define and identify the difference between acids, bases and salts.

Collect a soil sample and properly prepare it for testing.

Use a soil test kit to determine pH and the presence of nutrients.

Determine, from soil test information, the amounts of N, P, and K fertilizer to apply.

Define fertilizer and demonstrate its effect on plants.

Calculate the available nutrients in a fertilizer using fertilizer formula and information from the fertilizer bag label.

Distinguish among the various types of fertilizers, dry liquid & gas.

Identify natural and artificial sources of plant nutrients.

List and describe the methods of applying fertilizer.

Describe the importance of timing when applying fertilizer.

List and practice safe procedures in handling, applying, and storing fertilizer.

Use the microcomputer to determine the best application level of fertilizer for a given crop and yield.

Describe those conditions that determine the type and amount of fertilizers to apply.

Explain why producers must fertilize their crops.

Calculate the amount of fertilizer to apply at given application rates.

Plant, cultivate and record growth patterns of crops using different fertilizers, soils, and chemicals.

Demonstrate the use and maintenance of fertilizer spreading devices.

Calculate fertilizer application using a spreader.

REFERENCES

Jones, Fertilizers and Soil Fertility, Reston Publishing Company, 1979.

The Fertilizer Handbook, The Fertilizer Institute, 1015 Eighteenth Street, N.W., Washington, D.C., 1976.

Western Fertilizer Handbook, California Fertilizer Association, 1975.

Fertilizer Instructional Unit, Department of Agricultural and Industrial Education, Montana State University, 1980.

UNIT -- FIELD CROP MANAGEMENT

Upon completion of the Field Crop Management Unit, the student will be able to:

Identify the physical characteristics of a well-prepared seed bed.

List and describe the factors affecting seed bed preparation to include: a) moisture, b) oxygen, and c) temperature.

Demonstrate use and maintenance of tillage equipment necessary for seed bed preparation.

Discuss the importance of timing cultural practices in seed bed preparation.

Describe the effects of too much or too little moisture on seed bed preparation.

Describe methods of seed bed preparation in various crops common to the area.

Discuss the importance of planting hybrid and certified seed.

Determine optimum planting date, rate and depth of seeding crops common to the area.

Calculate recommended seeding rates and quantity of seed.

List and describe methods of planting to include: a) surface planting, b) furrow planting, c) broadcast seeding, d) wheel track planting, d) plow-plant planting, and f) ridge planting.

Calculate percentage of PLS (Pure Live Seed).

Calculate germination percentage.

Use laboratory equipment to determine germination percentage of selected seed samples.

Demonstrate the use and maintenance of different types of seeders used for the various seeding operations.

Calibrate various types of seeders.

Use proper laboratory procedures to determine moisture content of soil at seeding time.

Describe reasons for cultivation.

Describe irrigation methods common to the area to include: a) surface, b) subsurface and c) aerial.

FIELD CROP MANAGEMENT (Continued)

Demonstrate the use of irrigation methods.

Demonstrate an understanding of maintenance procedures used in sprinkler irrigation systems.

Determine the importance of timing and frequency of irrigation in producing irrigating crops.

Determine the amount of moisture required to grow the various crops in your area.

Describe harvesting methods appropriate for crops grown in Montana.

Demonstrate use and maintenance of harvesting equipment appropriate for crops grown in the area.

Identify crop seed and plant samples and determine quality of crop as it relates to U.S. grain standards.

Calculate the yield of a crop per acre.

Distinguish between the humid and arid climates across the United States.

Describe alternate tillage methods used in Montana.

Define and describe the purposes of cultivation, minimum tillage, summer fallow, no-till, and chemical till.

Identify and discuss the reasons for following good tillage practices.

Distinguish between primary and secondary tillage.

Use and maintenance of implements used for primary and secondary tillage.

Describe the function and advantage of various tillage implements commonly used in the area.

Identify the conditions that determine the time and depth of cultivation.

Discuss the proper management of crop residues.

Discuss the advantages and disadvantages of the various harvesting methods.

Calculate the number of acres in a parcel of land.

Identify the number of acres in the standard land areas.

Read a simple legal land description.

REFERENCES

Boone-Richer-Wilson, Producing Field Crops, Interstate Printers and Publishers, 1981.

Bishop, Carter, Chapman , Bennett, Crop Science and Food Production, MdBraw Hill, 1983.

Ware, Complete Guide to Pest Control, Thomson Publications, 1980.

Plant Production Management, Agricultural and Industrial Education, Montana State University.

The Montana Small Grains Guide, Bulletin 364, Montana Cooperative Extension Service, August 1985.

UNIT-- RANGE MANAGEMENT

Upon completion of this Range Management Unit, the student will be able to:

Define range and describe range management.

List factors affecting range plant growth.

Distinguish between native and introduced range plants.

Classify range plants: a) as decreases, increases, invaders, b) according to forage value, c) according to grass-forb-shrub, and d) according to cool and warm season plants.

Identify common range plants of Montana.

Identify poisonous plants common to Montana's rangeland.

Use a hand lens to identify range plant parts and describe their function.

Describe how the range plant processes affect the environment.

Define an animal unit and an animal unit month.

Calculate range condition and classify as excellent, good, fair or poor.

Use a range soil site to determine soil condition.

Determine effects of wildlife on rangeland.

Calculate degree of utilization of native range.

Determine range stocking rates and carrying capacities.

Calculate stocking rates for a typical Montana ranch.

List and describe approved practices for improving native range condition.

List problems associated with over grazing of native range.

Identify and describe practices to prevent over grazing.

Identify methods for renovating native rangeland.

List practices that will increase production of forage growth.

Identify and describe methods for controlling weeds and brush on rangeland.

List advantages of seeded pasture.

REFERENCES

Montana Rangeland Resource Program, Department of Natural Resources and Conservation, 1977.

Range Management Units 1, 2, 3, 4, 5, Montana Extension Service.

Range Management, Dept. of Agricultural and Industrial Education, 1976.

State Plant List - Activities and Awards Handbook.

Range Simulator from Montana State University.

UNIT --BASIC HORTICULTURE

Upon completion of the Basic Horticulture Unit, the student will be able to:

Write a definition of horticulture.

Explain the importance of horticulture as an industry.

Identify horticultural plants.

Classify horticultural plants according to their life cycle.

Describe the importance of water on plant growth.

Define the effect that light quantity, quality, and duration has on horticulture plants.

Discuss the effect temperature has on plant growth.

List reasons for pruning a fruit tree.

Demonstrate techniques of pruning trees.

Demonstrate types of asexual propagation of plants: cuttings, layerage, budding and grafting, and specialized structures.

Transplant a tree or shrub outdoors.

Describe the process of establishing a lawn.

List nutritional needs of lawns.

Control lawn weeds using mechanical and chemical means.

REFERENCES

Richardson-Moore, Working in Horticulture, McGraw Hill, 1980.

Nelson, Greenhouse Management, Interstate, 1980.

Hartmann-Kester, Plant Propagation, Prentice Hall, 1975.

Nelson, Greenhouse Operation and Management, Reston Publishing co., 1981.

Half Acre-Barden, Horticulture, McGraw Hill, 1979.

UNIT -- CROP PEST MANAGEMENT

Upon completion of the Crop Pest Management Unit, the students will be able to:

Describe how weeds, insects and disease cause economic loss throughout the food chain.

Describe the methods of classifying weeds based upon growth characteristics.

Classify common weeds as to a) life cycle, b) type of leaf, c) growth habits, and d) method of propagation.

Describe the methods by which weeds are spread from place to place.

Distinguish between noxious, semi-noxious and common weeds.

Describe common cultural practices used in controlling weeds.

Describe the biological pest control process.

Identify weed seeds and plants and insects common in Montana.

Describe the function and major features of an Integrated Crop Pest Management (I.C.P.M.) system.

Identify ways in which insects have an economic impact on crop production.

Explain how plants become resistant to disease.

Describe the basic characteristics of diseases in plants and what methods are used to combat such diseases.

Describe how chemicals control pests.

Describe the various types of insect life cycles.

Describe the physical characteristics of the common insects species found in Montana.

Distinguish between beneficial and harmful insects.

Describe how insects develop and multiply.

Identify the ways insects can spread from field to field.

Describe the feeding habits of insects.

Identify harmful insects common to Montana.

REFERENCES

Bishop, Carter, Chapman, Bennett, Crop Science and Food Production, McGraw-Hill, 1983.

Ware, George W., Complete Guide to Pest Control, Thomson Publications, Fresno, California, 1980.

Klingman, Glenn C. & Ashton, Floyd M., Weed Science Principles & Practices, John Wiley & Sons, New York, New York, 1983. (Teacher's Reference)

Metcalf, R.L. & Luckmann, W.N., (Ed) Introduction to Insect Pest Management, John Wiley & Sons, New York, New York, 1983. (Teacher's Reference)

UNIT -- AGRICULTURAL CHEMICALS

Upon completion of the Agricultural Chemicals Unit, the student will be able to:

Define the word "pest".

Classify pests into the main categories.

Identify common pests in the local area.

Describe insect metamorphosis.

Select the chemical needed to fill a particular purpose and demonstrate its effect on plants.

Read a pesticide label and describe what it says.

Describe the advantages and disadvantages of using various methods of applying chemicals.

Calibrate chemical application equipment.

Discuss importance of timing when applying chemicals.

Determine costs involved with chemicals.

Demonstrate safety procedures to follow when handling chemicals.

Demonstrate safety procedures with storing chemicals.

List safe methods of disposing of empty chemical containers.

Discuss federal and state regulations, and licensing which govern the sale and use of agricultural chemicals.

Discuss the obligation producers have when they are using chemicals to control pests.

Choose appropriate methods of applying pesticides.

Mix pesticides properly and safely.

Describe the proper procedure for cleaning chemical applicators.

Determine amount of pesticide to apply per acre.

Keep appropriate records of chemicals and applications.

Demonstrate the proper use of and maintenance of spray equipment to include: a) tanks, b) pumps, c)hoses, d) gas engines, e) nozzles and f) delivery systems.

REFERENCES

Agricultural Chemicals, Agricultural and Industrial Education, Montana State University, 1975.

Ware, Complete Guide to Pest Control, Thompson Publications, 1980.

Pesticide Manual for Applicators and Dealers, Cooperative Extension Service, Montana State University.

Bishop, Carter, Chapman, Bennett, Crop Science and Food Production, McGraw Hill, 1983.

_____, Applying Pesticides: Management Application and Safety, American Association for Vocational Instructional Materials, Athens, GA.

UNIT -- CAREER OPPORTUNITIES IN PLANT SCIENCE

Upon completion of the Career Opportunities in Plant Science Unit, the student will be able to:

List career opportunities in the local area in soils and soil conservation, soil fertility areas.

List career opportunities in field crop management.

List career opportunities in range management, horticulture, forestry, and the agricultural chemical industry.

Determine competencies and requirements for a specific job in an area of student's interest.

REFERENCES

Hoover, Handbook on Agricultural Occupations, Interstate, 1977.

Career Preparation in Agricultural Resources, U.S. Dept. of Education.

Richardson, Moore, Working in Horticulture, McGraw Hill, 1980.

Dana-Johnson, Forestry Education in America, Society of American Forester, 1963.

Lee, Working in Agricultural Industry, McGraw Hill, 1978.

Curtis-Mercer, Exploring Occupations in Agribusiness and Natural Resources, McGraw Hill, 1976.

Farrington-Vaughn-Sartor-Brown, Fertilizers, Chemicals and Seed, McGraw Hill, 1980.

Career Preparation in Ornamental Horticulture, A Curriculum Guide for High School Vocational Agriculture, U.S. Dept. of Health, Educ. and Welfare, Office of Education, 1974.